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Signed K A Richards

Dated 13 March 2000.

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Request for grant of a patent

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The Patent Office

Cardiff Road
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1.	Your reference	DC5465UK
2.	Patent application number *(The Patent Office will ...)* 9904347.3	26 FEB 1999
3.	Full name, ... or of each applicant *(un... all surnames)*	Shane Robert McGill McGill Technology Building Endeavour Park, London Road, Addington, West Malling, KENT, ME19 5TW.
	Patents ADP number *(if you know it)*	British 7553530001
	If the applicant is a corporate body, give the country/state of its incorporation	
4.	Title of the invention	FOOD BLENDING APPARATUS
5.	Name of your agent *(if you have one)*	**Lewis & Taylor**
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	**5 The Quadrant** **Coventry** **CV1 2EL**
	Patents ADP number *(if you know it)*	**711001**

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and filing date of the earlier application

Number of earlier application	Date of filing *(day / month / year)*

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'yes' if:*
a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.
See note (d))

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	11
Claim*(s)*	
Abstract	
Drawing*(s)*	14 + 14

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translation of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature Lewis & Taylor

Date 25 February 1999

12. Name and daytime telephone number of person to contact in the United Kingdom

David R Cowan
01203 222756

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FOOD BLENDING APPARATUS

This invention relates to food blending apparatus and to a method of blending food within a container. The invention has particular application to milkshakes but can be used with other food products which need to be blended, particularly those which need to be dispensed ready for consumption in or out of the premises where blending is effected.

An object of the invention is to provide improved blending apparatus and a method of blending food within a container.

According to the invention food blending apparatus comprises a container having an upper opening for admitting food product into the container, a closure for the upper opening, and blending means for blending product within the container, the blending means being drivingly connected to drive means, the blending means being locatable in the container by location means at the base of the container and the blending means being for rotation relative to the location means, the blending means extending upwardly along the container and having drive connection means towards its upper end to drive the blending means by said drive means.

Preferably the location means is an upstanding member on which the blending means is rotatably mounted. The blending means may have a generally circular cross section with outwardly extending blending blades on the outer surface. The blending means may have an opening in its lower end to receive the location means.

Towards the upper end of the blending means is drive means, for example, an opening for driving connection with the drive means.

Conveniently the blending means is of a shape whereby individual blending means are nestable one in the other when separated from the container. Similarly the container may be shaped so that the containers are nestable one in the other when separated from the blending

means.

Preferably the blending means has a series of blending blades spaced along its length, or a single blade may effect sufficient blending action.

In one arrangement the blending means is of truncated cone shape and may have at least one longitudinal slot for receiving the blending means of another blending means whereby they are nestable.

Preferably the location means corresponds in its outer shape to an internal opening in the blending means so that the blending means fits rotatably thereon. The location means may also have a lower opening accessible from the exterior of the container. The lower opening may have a cross section of polygonal shape, for example of square shape, for receiving a correspondingly shaped location member whereby the container is held on the location member during blending. A similar location member may be employed to locate the container during filling, transport and at other stages in the filling to blending sequence.

The closure will usually have means for accessing the blending means through the closure and there may also be provided an opening in the closure for accessing the contents during consumption, for example through a straw.

The apparatus may also include a mechanism by which the container is supported and from which drive is transmitted to the blending means during a blending operation. Such mechanism may include the location member upstanding from a container support to engage into and hold the container. The location member may be heated. In addition a drive assembly may include a drive motor and a driving member connected to the drive motor and moveable into driving engagement with the blending means.

The mechanism may also include a container storage system, preferably refrigerated, and means for moving containers from the storage system into a blending position.

Further features of the invention will appear from the following description of an embodiment of the invention given by way of example only and with reference to the drawings, in which:

Fig 1 is a vertical section through a container assembly,

Fig 2 is a section corresponding to that of Fig 1 of the container of the assembly of Fig 1,

Fig 3A is a side elevation of blending means for the assembly of Fig 1,

Fig 3B is a side elevation of the blending means of Fig 3A in the direction 3 in Fig 3A,

Fig 4A is a cross section through a closure for the container assembly of Fig 1,

Fig 4B is a view in the direction 4 in Fig 4A,

Figs 5, 6, 7 & 8 show the sequence of operations for assembling and filling the container assembly of Fig 1,

Fig 9 is a side elevation of a blending mechanism for the container assembly of Fig 1,

Fig 9A is a side elevation of another form of blending mechanism,

Fig 10 is a side elevation of apparatus for storing and dispensing container assemblies, and

Fig 10A is a side elevation corresponding to Fig 10 of modified apparatus,

Fig 11 is a plan view of carousel arrangement for the apparatus of Fig 10,

Fig 12 is a side elevation of a storage system for container assemblies,

Fig 13 is a plan view on the line 13-13 in Fig 12,

Fig 14 is a scrap view, in section, of an alternative form of container assembly,

Fig 15 is a plan view of blending means of the assembly of Fig 14,

Fig 16 is a side view of alternative blending elements,

Fig 17A and 17B are views in direction 17 in Fig 16.

Referring to the drawings there is shown a container assembly 1 for use in blending apparatus which comprises a body portion 3 (Fig 2) consisting of a plastics vessel in the shape of a beaker having a base 3A, upwardly diverging, circular cross section side walls 3B and an upper edge 3c of the container. The container is nestable with other containers, when empty, by location of the base through the upper opening of another container. A handle may be provided on the side wall 3B extending outwards from the upper end of the body, above the level of a container with which it is nested.

In its base 3A the container is formed with a peripheral downwardly projection portion 3D and centrally of the base 3A is formed a hollow, upwardly extending location member 3E. The member 3E is closed at its upper end and is of truncated cone shape having an opening 3F at its lower end accessible from the outside of the container. The opening 3F has a rectangular shape as shown in the lower part of Fig 2 for location of the container on a support, to be described but may be of any other suitable shape. An annular recess 3G extends around the member 3E and opens into the internal volume of the container. The location member 3E may not be hollow, in some applications, and may be formed of foamed plastics.

The container body or vessel 3 is provided with a closure member 2 (Figs 4A and 4B) constituting a lid arranged to fit over the upper end of the body 3 over the upper edge 3C and to close the opening at the top of the body. The lid 2 is generally circular having an outer

portion 2A which fits over the upper edge 3C of the body to be sealingly engaged over the opening. This may be by a clip arrangement, by heat sealing, or by any other suitable means for securing the lid 2 on the body 3.

At the centre of the lid is formed an opening 5 through which drive means, to be described, extends during a blending operation. After the container has been filled and during transport prior to a blending operation the opening is sealed with a removable seal 5A usually adhesively attached to the lid 2 and having a tab 5B by which it is peeled off. Instead of the seal 5A the lid may have a moulded-in, removable section. A bung 5C may be located in the opening 5 after the sealing member 5A has been removed and after a blending operation. Alternatively the removable section may be relocated in the opening after blending.

The assembly also includes a blending element 7 (Figs 3A and 3B) which is arranged for location in the container over the location means 3E and for rotation relative to the container and location means. The blending element 7 comprises a hollow, circular section body 8 open at its lower end 9 and being of generally frustro conical shape arranged to fit over the correspondingly shaped location member 3E. Impeller blades 12 are located in pairs axially spaced along the element 7 and extending outwardly from the central axis in the radial direction. The blades 12 in each pair extend from opposite sides of the element 7 and are angled to the horizontal to impart a blending action on the contents of the container. The blending element 7 is provided with longitudinal slots at opposite sides extending partway along the length of element from its lower end, which slots are to accommodate the blades 12 when the element 7 is nested with other elements, as seen in Fig 6. Instead of the blades 12 being arranged as shown, blades at different positions may have different shapes and orientation for different functions e.g. blending and circulation. Moreover the blades 12 may fold over and avoid the need for the slots to nest the elements, or the blades may be small enough to be received in another element.

At the upper end of the element 7 there is provided an opening 13 the inner sides of which are shaped to receive, in driving engagement therewith, drive means for driving the blending element during a blending operation.

Referring now particularly to Figs 5-8 there will be described the sequence for assembling and filling the container assembly. In Fig 5 there is shown in the upper part a stack of nested container bodies 3 from which the lower container body has been released. The body of Fig 5 is then assembled with a blending element 7 from a stack of such elements which are nested together as seen in Fig 6. The blending element 7 is located onto the location member 3E of the container 3. In effecting this assembly the lower edge of the element 7 enters the annular recess 3G and may be locked in said recess to inhibit axial movement of the element 7 whilst retaining the ability of the element 7 to be rotated relative to the body 3. However, the annular recess may be omitted.

The assembled container body 3 and element 7 is then charged or filled with product to be dispensed by filling means shown diagrammatically at 15 in Fig 7. The filling means 15 may be of any convenient kind and can be a filling machine of known form which fills the body 3 with the product P up to the desired level within the body 3.

After filling a closure member 2 is detached from a stack of closure members as seen in Fig 8 and is secured to the upper opening of the body 3 to seal the contents of the container. The closure member 2 may be in the form of a membrane heat-sealed to the upper edge of the body of the container with or without a further lid. The membrane may be punctured to gain access for the drive means and for a straw.

After filing and fitting of the closure member the container may be overwrapped with film which may be heat-shrunk around a part or all of the container, the film carrying printed material and being pierceable to access the drive and straw into the container.

This completes the assembly and charging of the container with product and the container may be filled aseptically and/or may be frozen or semi-frozen subsequent to filling. Alternatively the filled container may be chilled.

The filled containers are transported and stored in their frozen or chilled condition or at ambient temperature until it is required to consume the product. Before consumption frozen

or semi-frozen product within the container assembly may be tempered i.e. brought to a higher blending temperature, for example in a tempering cabinet, and is then subjected to a blending operation which is performed in a blending apparatus such as shown in Fig 9.

The blending apparatus comprises a support for the container assembly which includes a seating surface 21 from which there is an upwardly extending location element 22 which is located into the opening 3F of the location member 3E of the container 3. The location element 22 has an outer profile corresponding to the profile of the opening 3F so that the container assembly is secured against rotation relative to the location element 22. The location element 22 may extend towards the upper end of the opening 3F or, as shown in the scrap view in Fig 9, the location element 22 may extend only along the lower end of the opening 3F. The provision of the location element 22 fixes the container assembly securely to the apparatus during blending. However the element 22 may be omitted and the container assembly held by the engagement of the drive means or by interfitting portions of the surface 21 with the container base. The location element 22 may be heated so as to heat the product in the container and assist the blending action.

Once in position the container assembly lies directly below a drive motor 25 having a drive output shaft 26 arranged for driving engagement with the blending element 7 by location in the opening 13. The motor 25 and associated shaft 26 is moveably mounted through an arm 27 guided along a guide rod 28 between an operational position as shown in Fig 9 and a raised position in which the shaft 26 is clear of the container assembly. Movement between these positions may be by a further drive motor 29 by which the shaft 28 is rotated to move the arm 27 along the shaft by threaded engagement therewith, or otherwise. Alternatively the arm 27 may be manually moveable between an operative and inoperative position. As a further alternative the container may be lifted up to locate with the drive.

The drive motor 25 and shaft 26 are operated to rotate the blending element 7 relative to the body 3 at a suitable speed and for a suitable duration, for the blades 12 to blend the product P within the container. Due to the blades 12 being located throughout the height of the container the whole contents of the container are quickly blended. The speed of rotation may

vary during a blending sequence and the drive direction may be reversible. Instead of a drive motor the element 7 may be manually rotated.

In one arrangement the containers, after blending, are moved from the blending position to an adjacent position, as shown in Fig 9, for removal from the location element 22 and subsequent consumption. Consumption may be through a straw which is inserted into the container through a weakened area of the closure 2. Alternatively the closure 2 may be removed from the container body 3.

The blending mechanism may incorporate a carousel 30 on which a plurality of filled containers are located rotatable about the central axis. At one position 31 of the containers on the carousel 30 the containers are in a blending position, that is arranged for driving engagement with a drive shaft. After blending the blended container is moved to a delivery or collection point 32 which lies adjacent a dispenser 33 for straws. There may also be a mechanism 34 for operating the carousel and dispensing mechanism for self service situations. After the container at 31 has been blended the carousel rotates to bring another container to the blending position and the location from which the blended container has been released is filled with a fresh filled container.

Referring to Fig 9A a similar blending apparatus to that of Fig 9 is shown. In this case the container assembly is located within a support 35 having a handle 35A during blending and, after blending, the assembly is lifted with the support 35 off the apparatus. The support 35 may be heated to raise the temperature of product in the container. The support may also be hinged to the base to permit entry and removal of the container.

Referring now to Fig 10 there is shown in side elevation an arrangement incorporating the carousel arrangement of Fig 12. In this drawing can be seen the carousel 30 on which the filled containers are supported. When the containers at 31 are to be blended a mandrel 36 is inserted into the lower opening 3F of the container and raises the container towards a motor 25 and associated shaft 26 located above the container until the shaft is in driving engagement with the impeller 7. The motor 25 is operated to blend the contents of the

container, the mandrel is withdrawn downwards and the container is then moved sideways after withdrawal of the mandrel 36 to a delivery point 32 from which the container can be accessed. Above each of the positions on the carousel 30 there is a vertical column of filled containers which can pass under gravity into the space on the carousel vacated by the blended container. There is provided an enclosure 37 in which the columns of containers and the blending mechanism are located and which may be refrigerated or heated to enable to enable the containers to be maintained at the desired temperature level. In Fig 10A there is a similar arrangement to Fig 10 except that the columns of containers are inclined to enable the columns to be recharged through a front opening in the enclosure 37. A dual channel electronic controller may be used for temperature control in the enclosure 37 controlling operation of heating means and cooling means according to the sensed temperature.

Referring now to Figs 12 and 13 there is shown a storage system for storing filled container assemblies. In Fig 13 is shown a storage unit consisting of an insulated housing 42 in which is located, one above the other, platforms 43 which are removably locatable in the housing.

Each platform 43 is generally circular and has an array of upwardly projecting location mandrels 22 which extend upwards into the container assemblies mounted thereon. The platform 43 and mandrels 22 are preferably of heat conducting material, such as aluminium, such that heat is conducted between the container contents and the interior of the housing. In this way the temperature of the contents of the containers is adjusted according to the temperature within the housing, and the contents of may be heated up (tempered) or cooled down to a predetermined temperature. Since the mandrels extend internally of the containers heat transfer takes place from without to within and from within to without the containers. Preferably the housing is kept at the desired tempering temperature or within a predetermined range of that temperature by heating/cooling means. A forced air circulation system may be used together with heating/cooling means to maintain the desired temperature of the product. The mandrels 22 may be omitted.

The circular platforms 43 may be used in the form of a carousel, as previously described, and removable, with the associated containers, from the housing. After dispensing of the contents of the container assemblies the platforms are recharged with filled assemblies for

tempering or otherwise.

Referring now to Figs 14 and 15 there is shown an alternative construction for the upper end of the blending element 7 and for the closure 2.

The blending element 7 is formed with an opening 13 for receiving the drive shaft for the element which opening is shaped with drive dogs 13A. The outer sides of the drive dogs 13A are arranged within a downwardly and outwardly directed, circular portion 13B of the lid 2.

The drive dogs 13A extend upwards from the upper end of the element 7 which has a cap 7A closing said upper end. On the lower side of the cap 7A is formed a part-spherical member 7B which is directed downwards and which is arranged to engage the upper end of the member 3E which is formed with a complementary depression. The member 7B and the depression provide bearing surfaces during rotation of the element 7. In Fig 14 is shown a straw 40 extending through a frangible opening in the lid 2.

After blending and consumption of product within the container assembly it is intended that the assembly be discarded but the components of the assembly are constructed to be recyclable. The invention provides a container assembly which is readily manufactured from plastics mouldings, there being three main components and the components being readily assembled. Moreover before assembly the components are capable of being stored in a compact fashion by being nestable with one another. Due to the construction of the blending impeller an efficient blending action can be performed on the product even if the product is not of equal consistency throughout the container and even if it contains relatively viscous components. Accordingly the blending operation is efficient and quickly effected for a variety of products.

The blending impeller, although located internally of the container, takes up relatively little space and does not materially affect the capacity of the container which can, if necessary, be of slightly enlarged diameter and/or depth to accommodate the loss of capacity.

By the provision of the longitudinal opening 3F of the container any tempering of the filled containers to a blending temperature is more quickly effected. Tempering of the frozen containers is also readily achieved in a storage system as seen in Figs 10 & 11 by circulation of tempering air throughout the housing 37.

The assembly requires no special sub assembly of components prior to shipping the components from the supplier or at the location where the containers are filled. The seal 5A for the lid 2 may be attached to the lid prior to or after distribution to filling site. In addition the container may be filled with product by pre existing filling machines.

The apparatus may be adapted to enable additional ingredients to be added to the container prior to, during or after the blending operation. Such ingredients may include flavouring aeration means, carbonation means, heating medium such as steam and/or solids such as ice, nuts, chocolate etc.... The container closure may be formed with means for permitting such ingredients to be added such as openings for the entry of tubes. The closure may be recessed at its edge for such a purpose.

In making the additions to the container the container should be accurately located during the introduction of such additions to ensure that the tube or other means for making the additions can access the container at a defined position.

The apparatus may also find application for heated product and at the blending/dispensing stage the product may be heated, for example by microwave heating means .

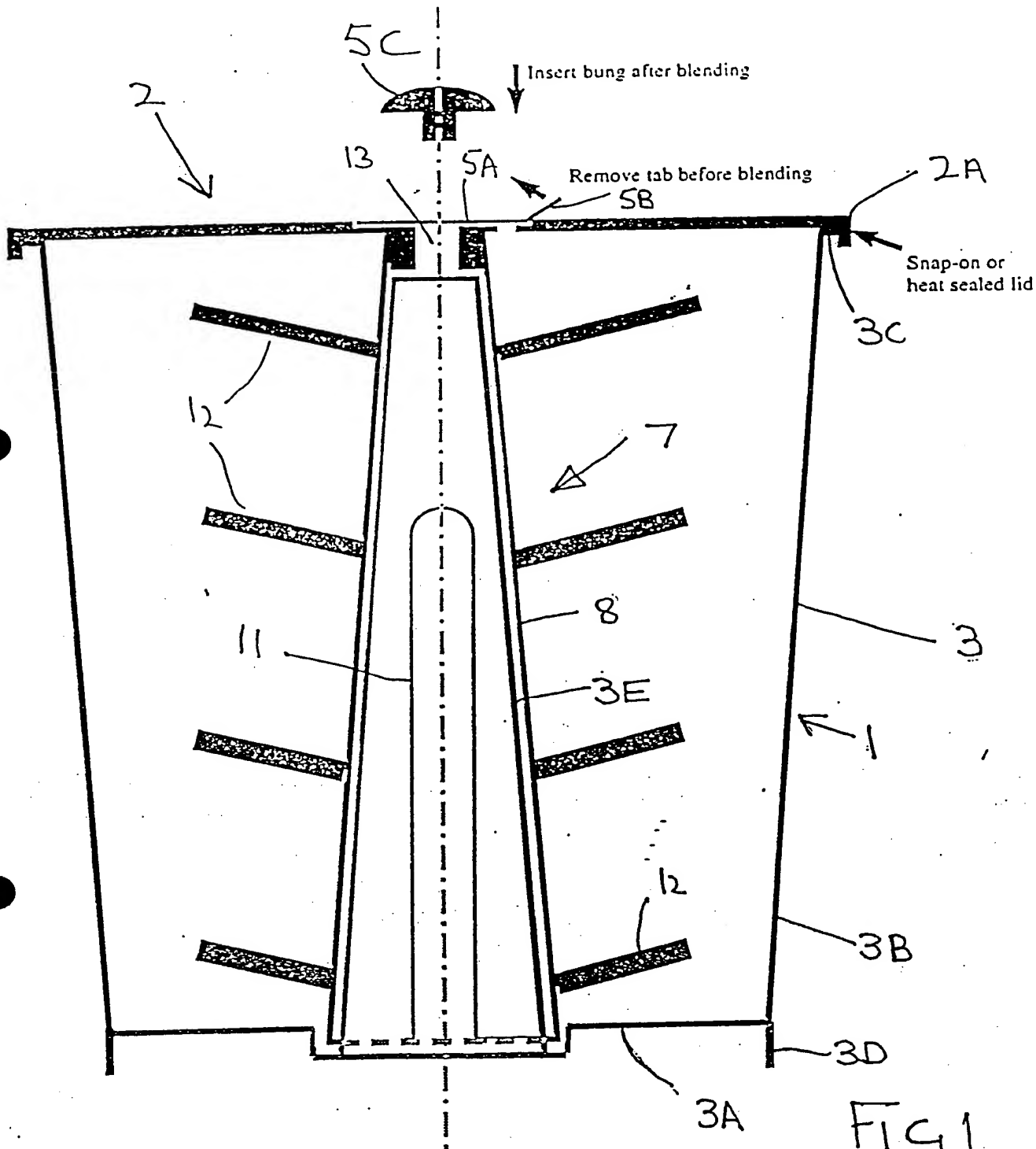

5C
Insert bung after blending
2
13
5A
Remove tab before blending
5B
2A
Snap-on or
heat sealed lid
3C
12
7
8
11
3
3E
1
12
3B
3D
3A

FIG 1

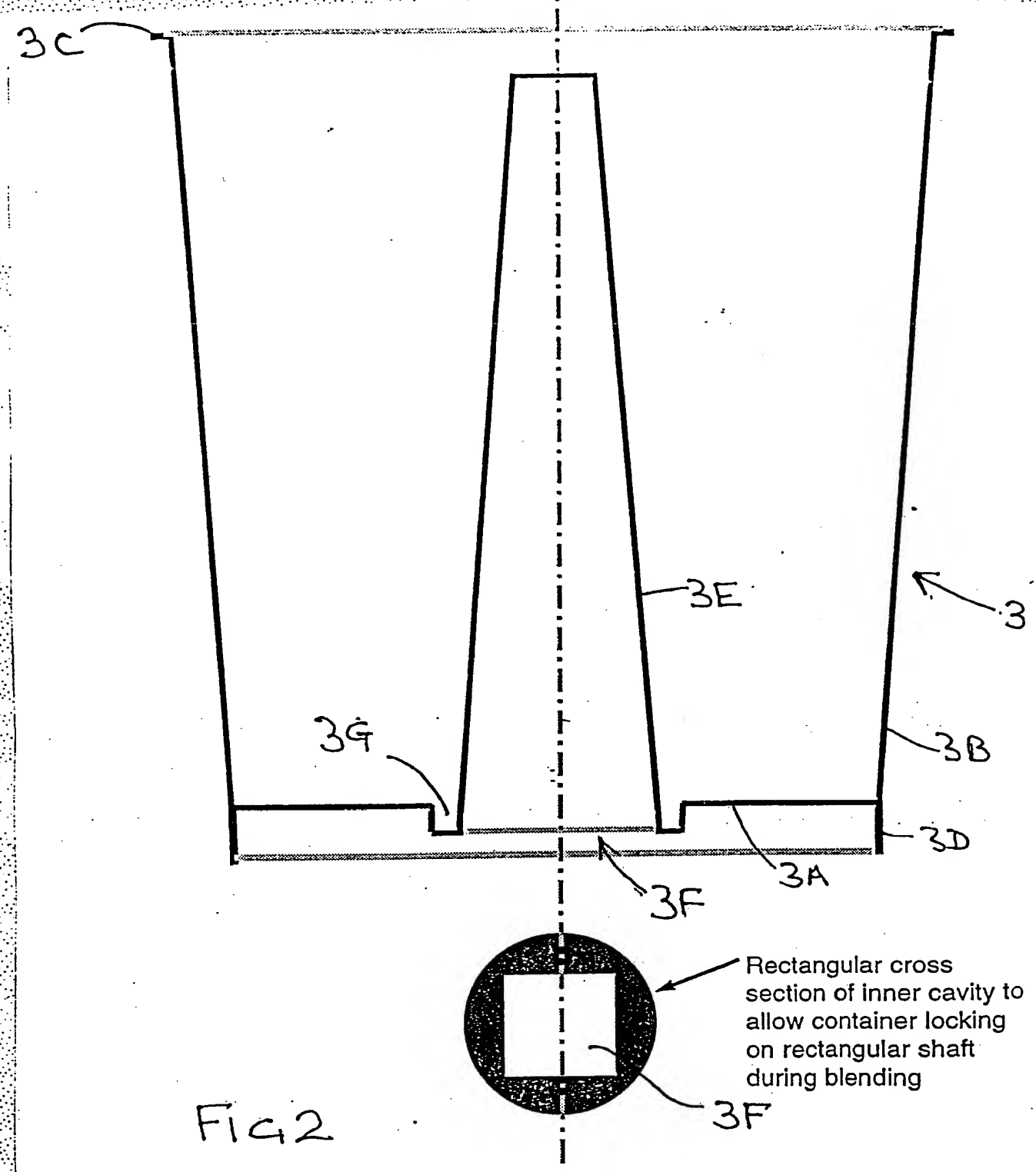

3C
3E
3
3G
3B
3D
3A
3F
Rectangular cross section of inner cavity to allow container locking on rectangular shaft during blending
3F

Fig 2

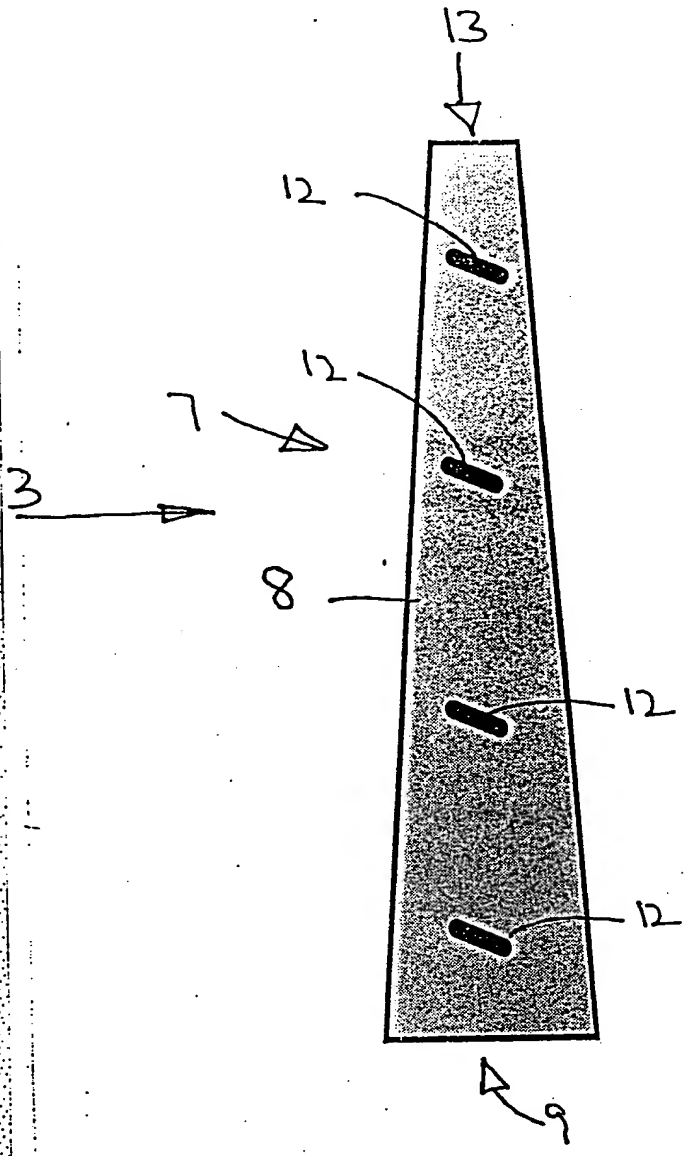


Fig 3A

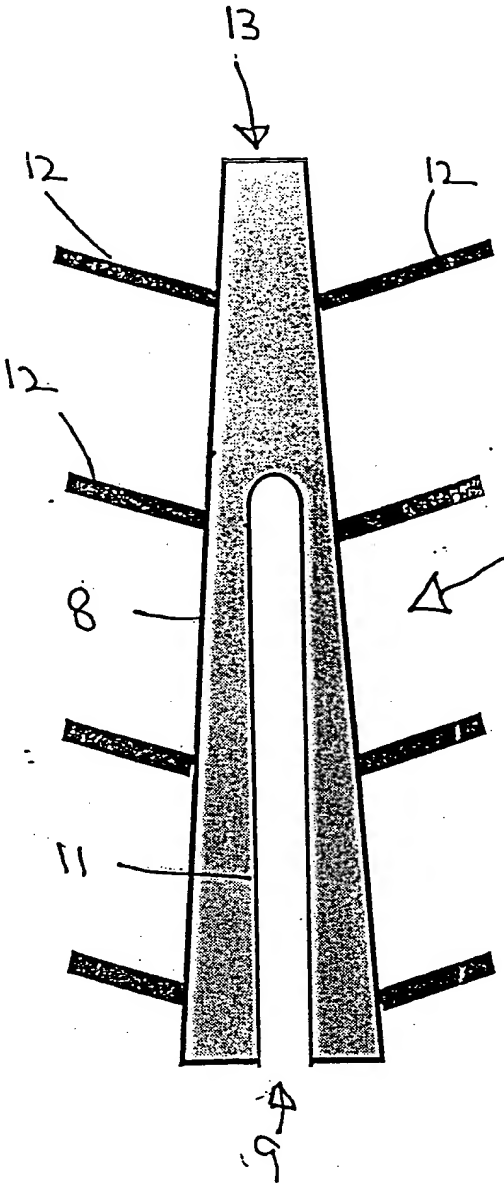


Fig 3B

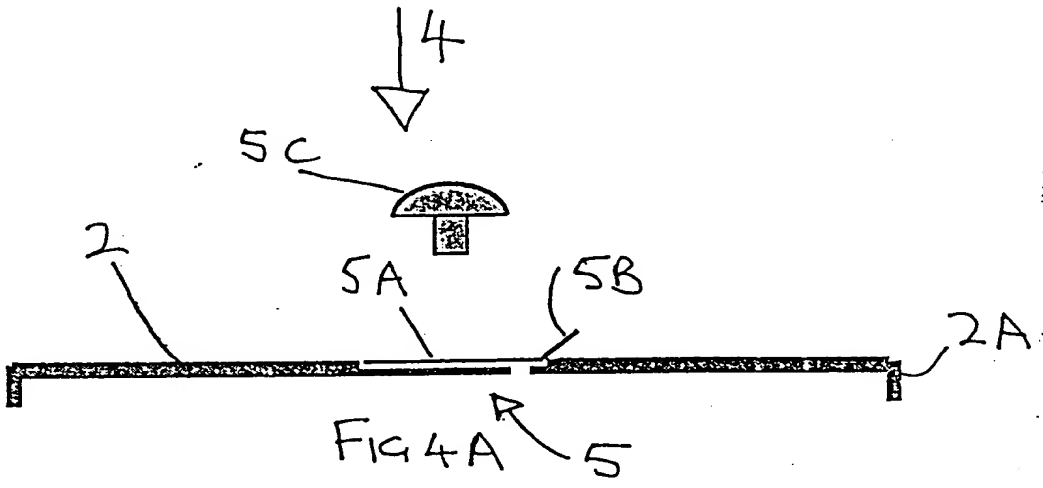


FIG 4A

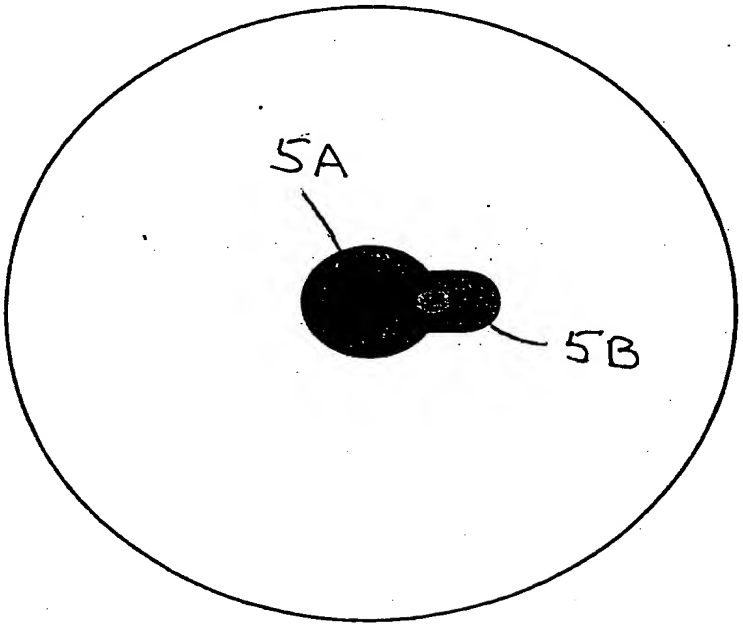


FIG 4B

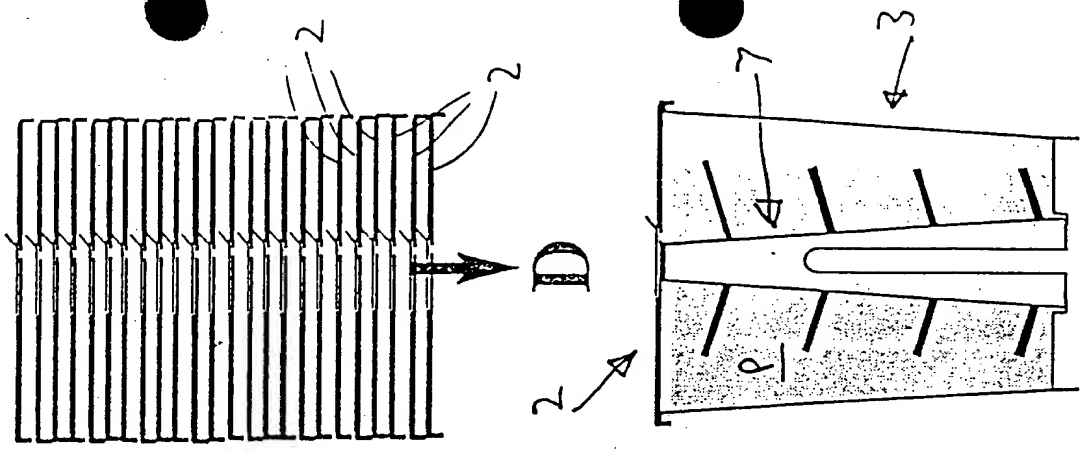


Fig 8

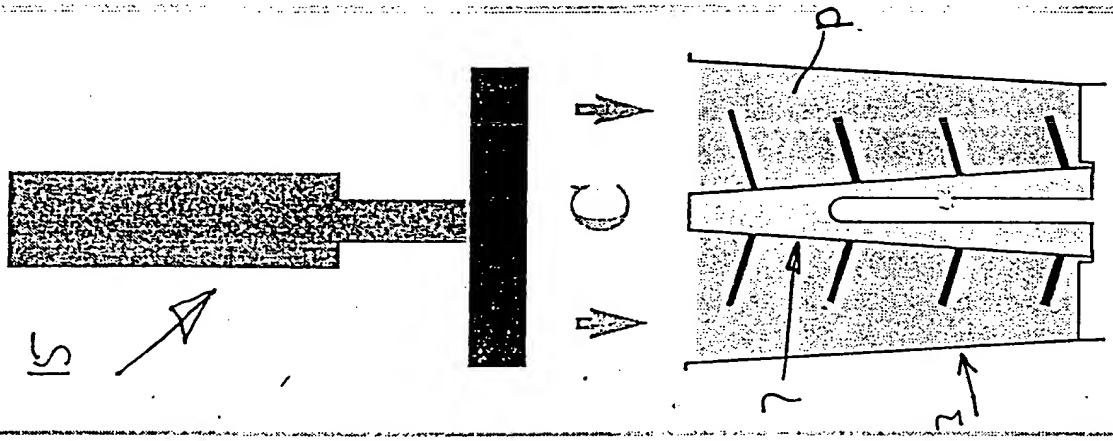


Fig 7

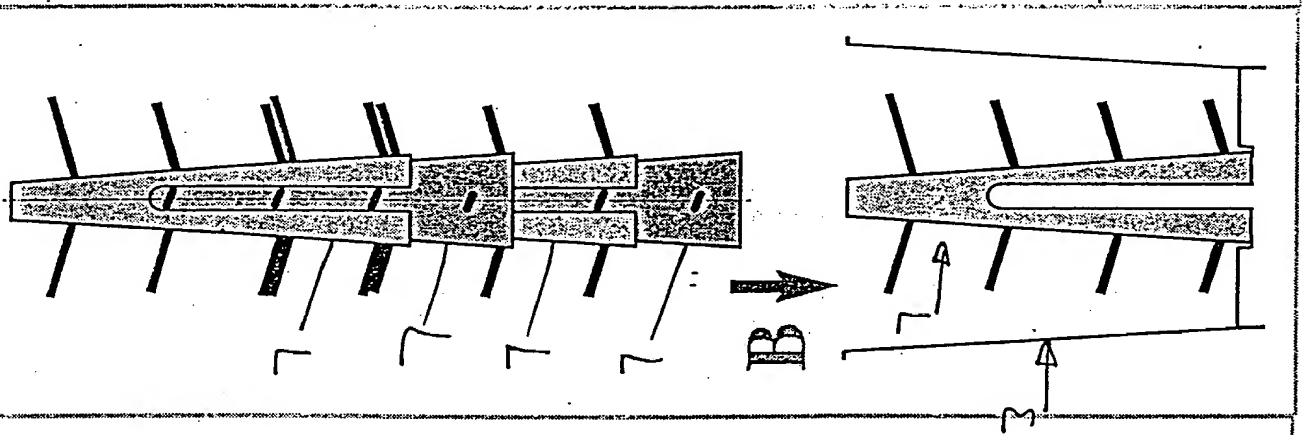


Fig 6

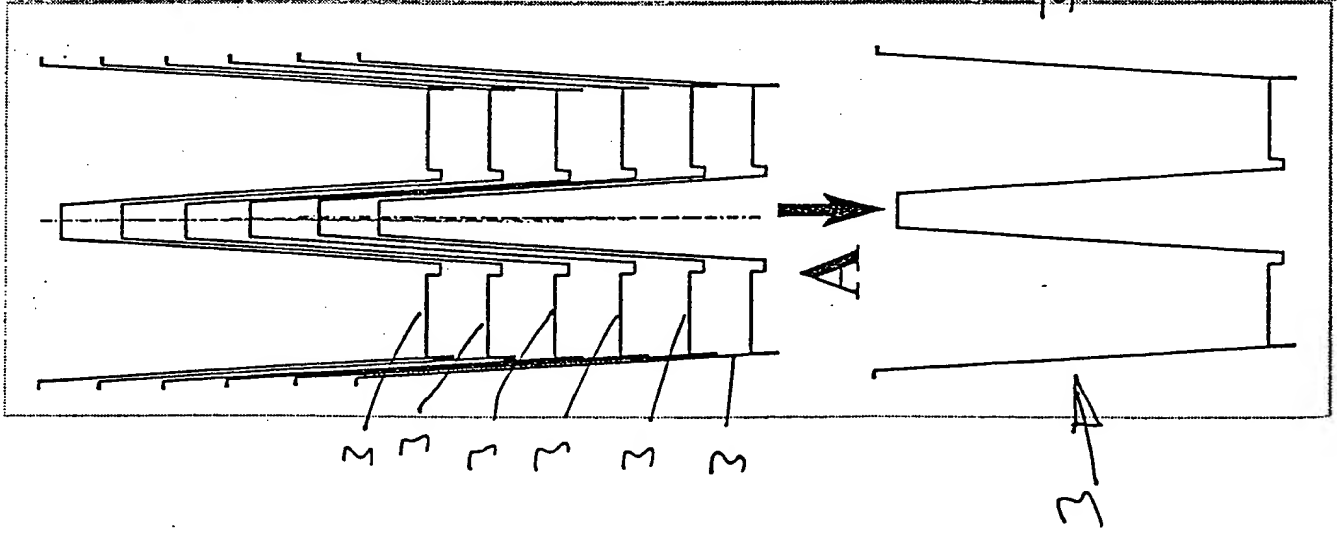


Fig 5

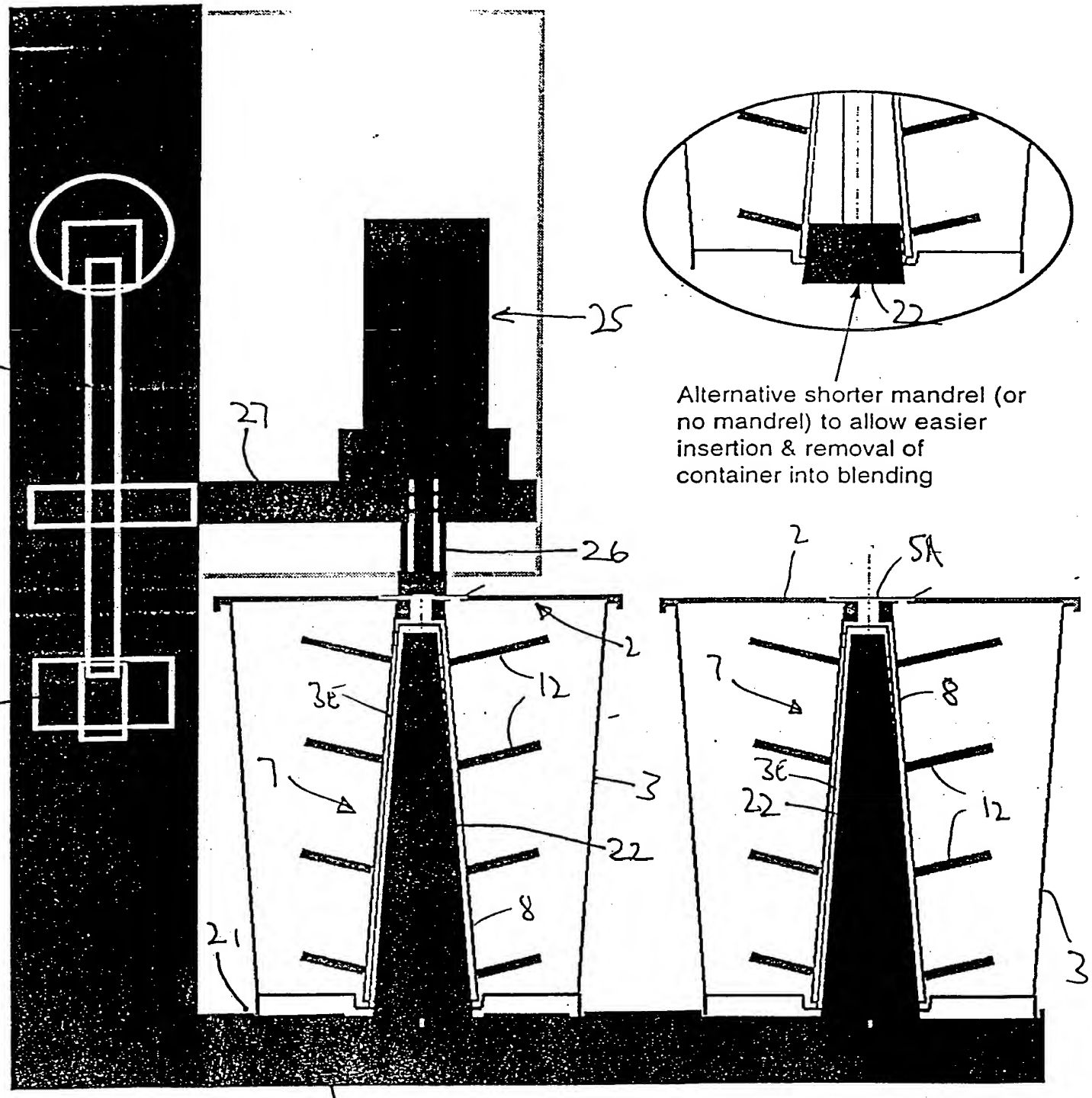

28
25
27
26
2
12
3E
7
3
22
8
21
29
20
2
5A
7
8
3E
22
12
3
22
Alternative shorter mandrel (or no mandrel) to allow easier insertion & removal of container into blending

Fig 9

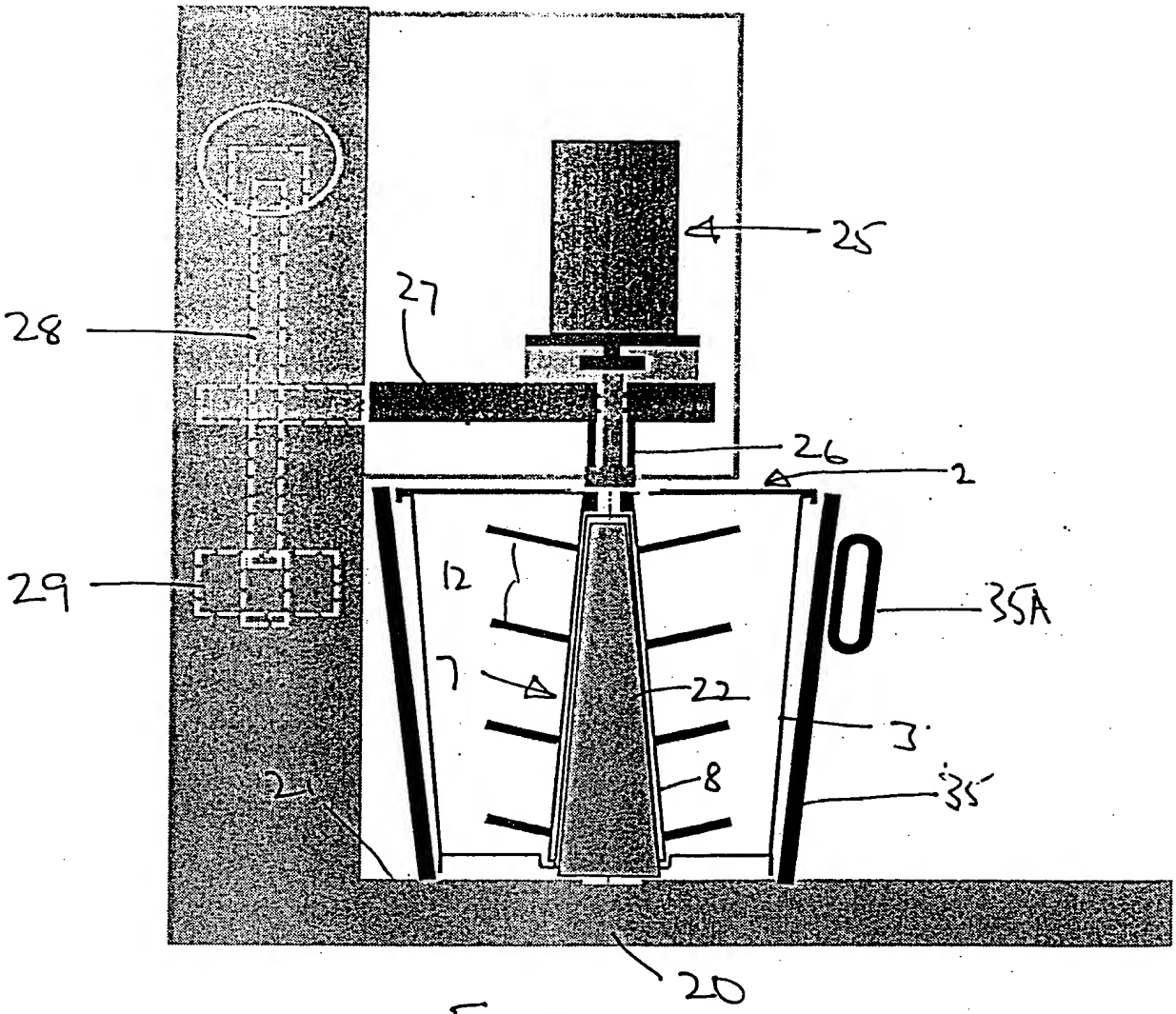


FIG 9A

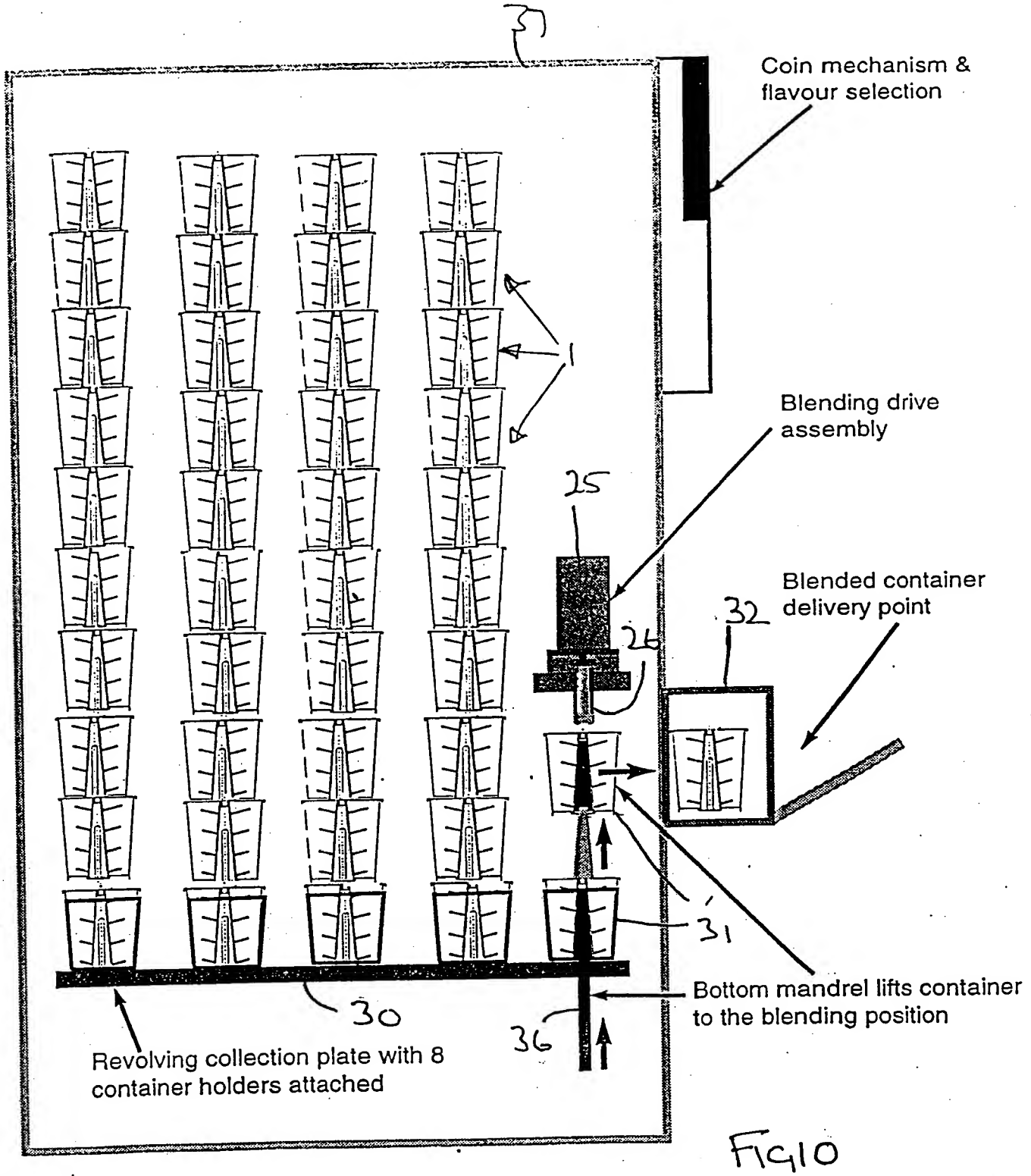

37
Coin mechanism & flavour selection
1
Blending drive assembly
25
26
32
Blended container delivery point
31
Bottom mandrel lifts container to the blending position
30
36
Revolving collection plate with 8 container holders attached

Fig10

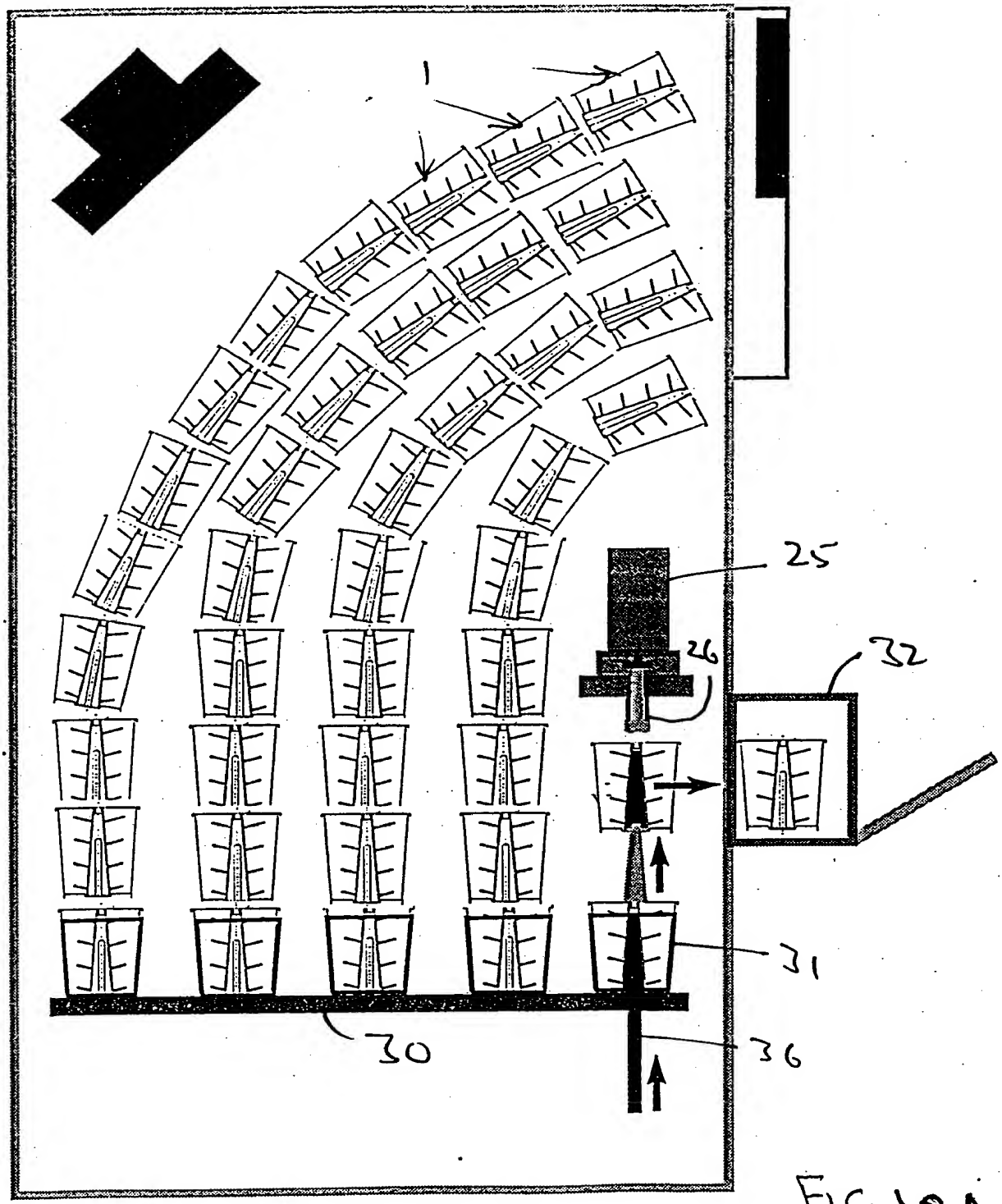


FIG 10A

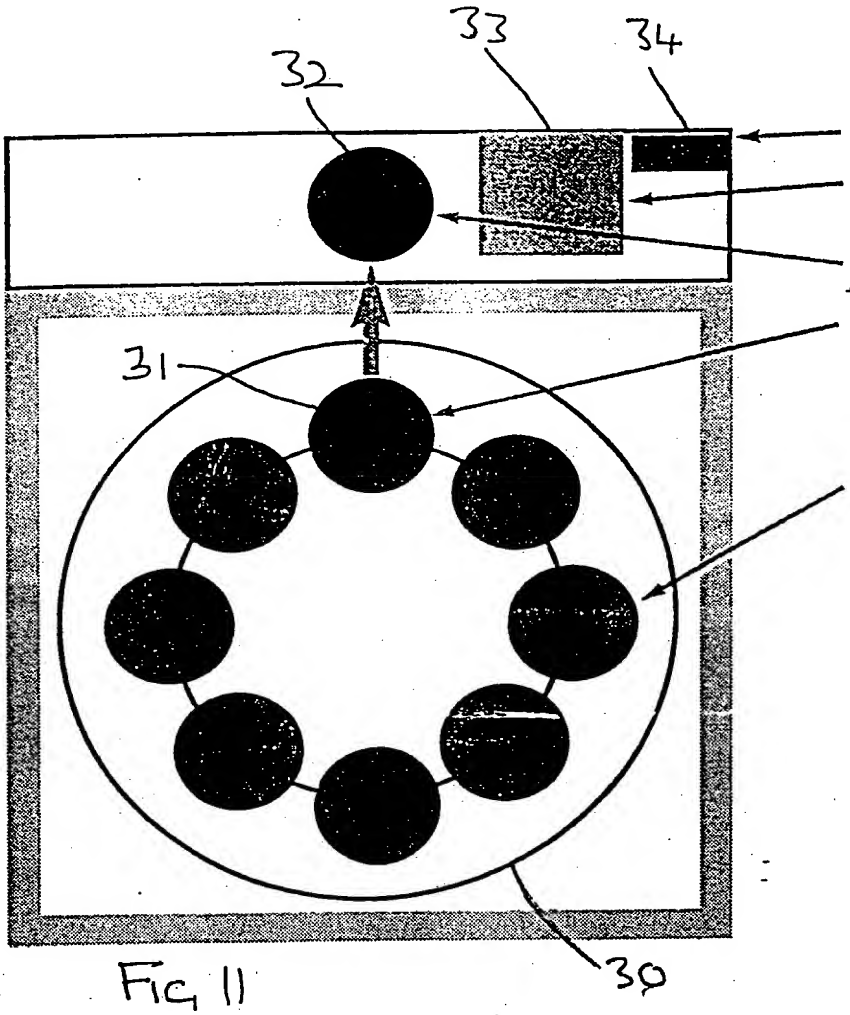

32
33
34
31
30
Coin mechanism
Straw dispenser
Delivery/collection point of blended container
Position for blending
7 static container stacks (or more)

Fig 11

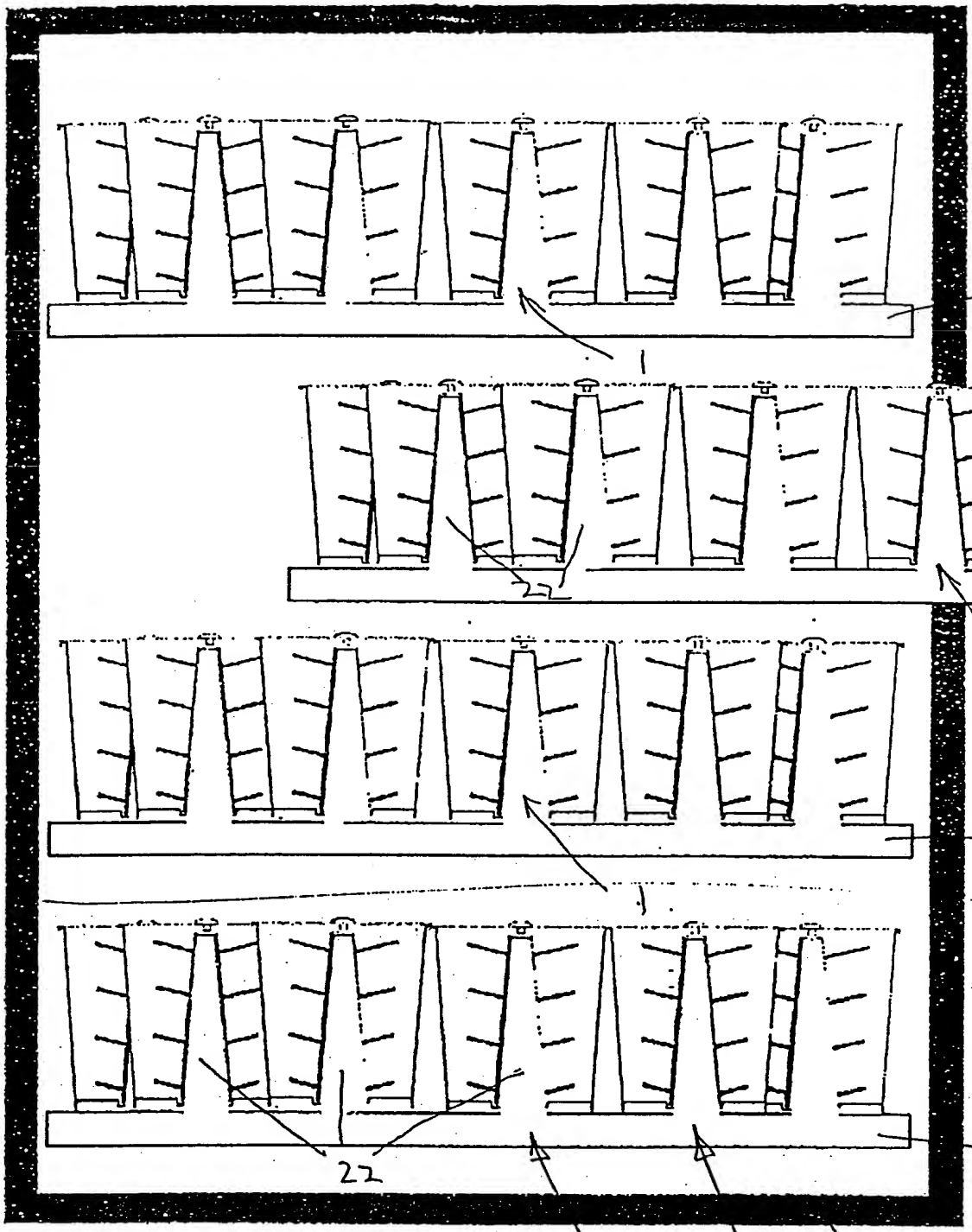
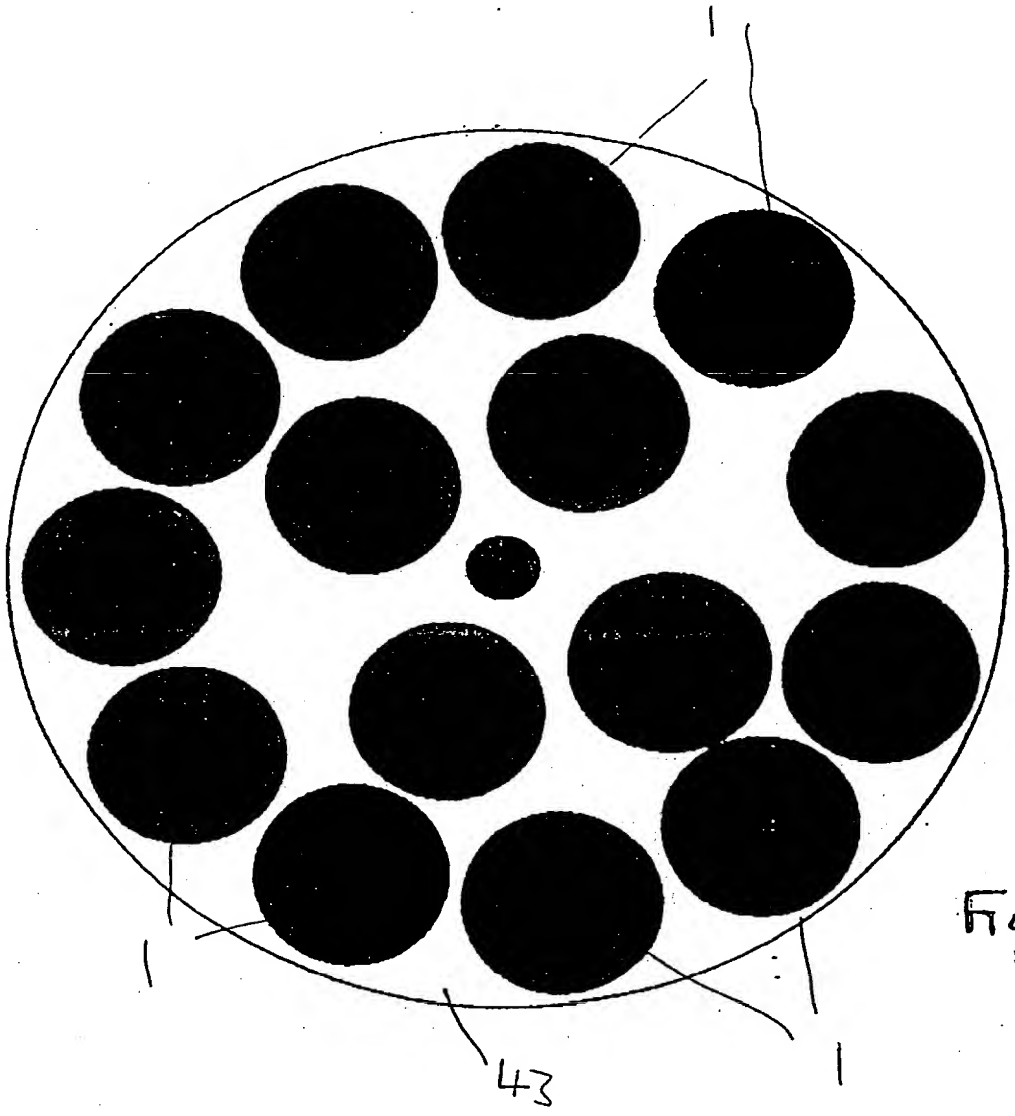


Fig 12



Revolver™

REVOLVE
MANUALLY

Fig 13

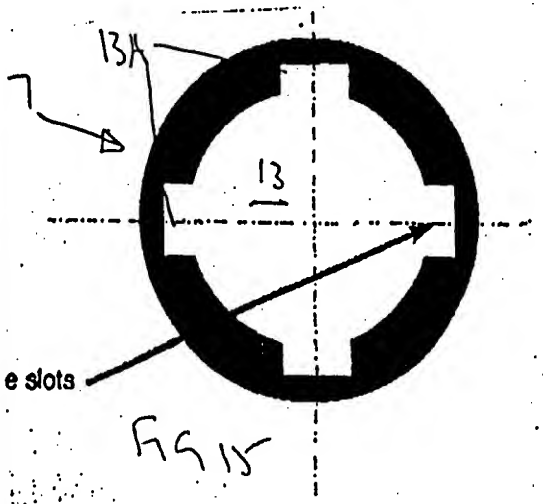

13A
7
13
e slots

Fig 15

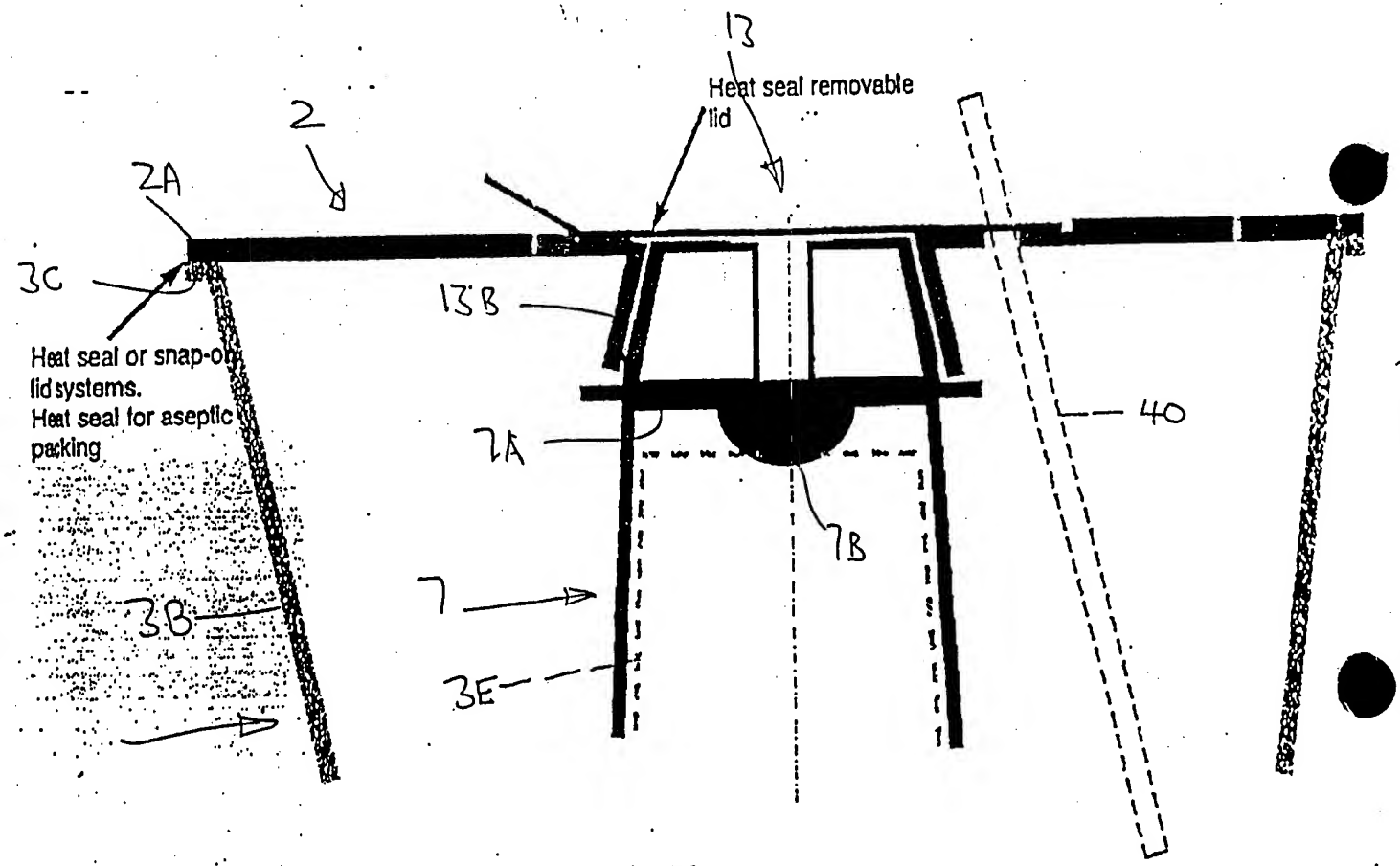

13
Heat seal removable lid
2
2A
3C
Heat seal or snap-on lid systems.
Heat seal for aseptic packing
13B
40
7A
7B
7
3B
3E

Fig 14

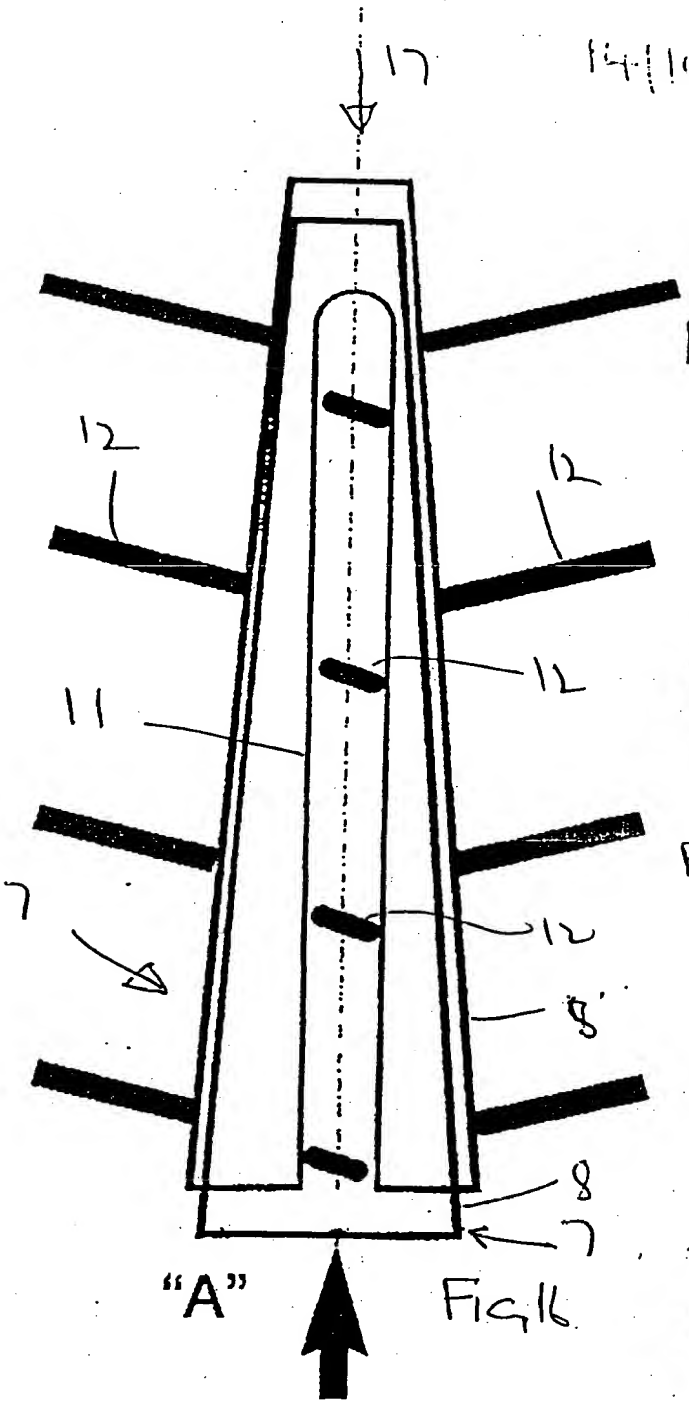


Fig 16

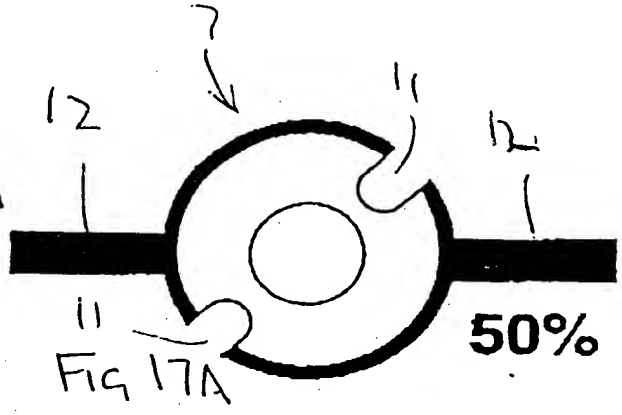


Fig 17A

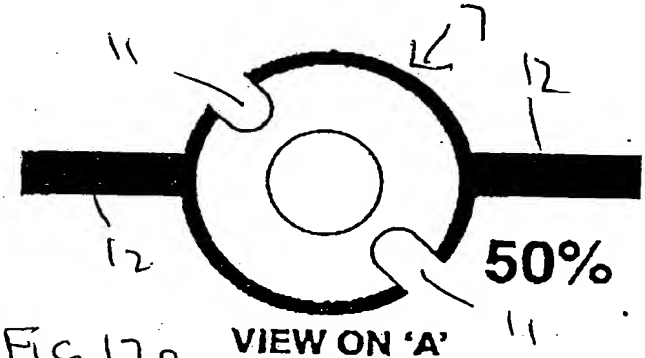
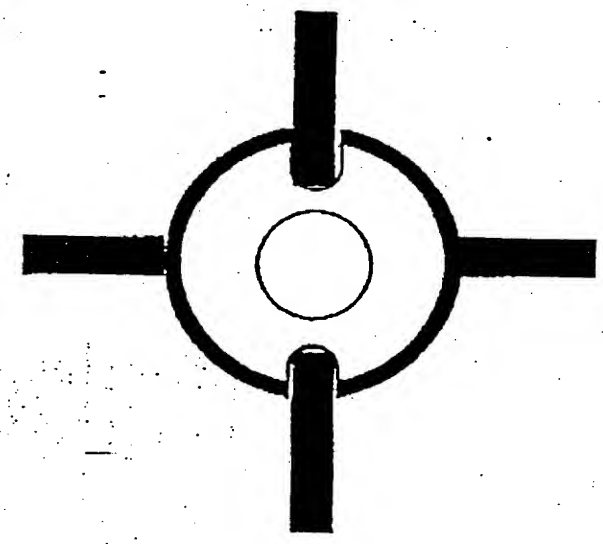


Fig 17B

VIEW ON 'A'
for 1/3 of units



NESTING SLOTS
By having 2 different positions for these, we can fully nest for lowest volume.